

In Re Patent Application of:
CAIN ET AL.
Serial No. 10/658,021
Filing Date: SEPTEMBER 9, 2003
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In the Claims:

This listing of claims replaces all prior versions and listing of claims in the application.

1. (Currently Amended) A mobile ad hoc network (MANET) comprising:

a plurality of mobile nodes each comprising a wireless communications device providing a selectable signal transmission pattern and a controller connected thereto;

said controller operating in accordance with a multi-layer protocol hierarchy for,

at an upper protocol layer, establishing a quality-of-service (QoS) threshold[[]],

at at least one intermediate protocol layer below the upper protocol layer, selecting between a unicast communications mode and a multicast communications mode based upon the QoS threshold[[]],
and

at a lower protocol layer below the at least one intermediate protocol layer, cooperating with said wireless communications device to transmit data to at least one destination mobile node based upon the selected communications mode and determine a QoS metric for the at least one selected route;

said controller also operating in accordance with the multi-layer protocol hierarchy for,

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at the at least one intermediate protocol layer, determining whether the QoS metric falls below the QoS threshold, and

at the lower protocol layer, modulating the data using a first modulation technique if the QoS metric is greater than or equal to the QoS threshold, and otherwise using a second modulation technique.

2. (Original) The MANET of Claim 1 further comprising:

at the at least one intermediate protocol layer, selecting at least one route to the at least one destination mobile node based upon the QoS threshold; and

at the lower protocol layer, cooperating with said wireless communications device to transmit the data to the at least one destination mobile node via the at least one selected route.

3. (Original) The MANET of Claim 1 wherein, at the at least one intermediate protocol layer, said controller determines whether to require data reception acknowledgements based upon the QoS threshold.

4. Cancelled.

5. (Currently Amended) The MANET of Claim [[4]]
1 wherein, at the lower protocol layer, said controller cooperates with said wireless communications device to

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change at least one signal characteristic based upon a determination that the QoS metric has fallen below the QoS threshold.

6. (Original) The MANET of Claim 5 wherein the at least one signal characteristic comprises at least one of power, gain, and signal pattern.

7. (Currently Amended) The MANET of Claim [[4]] 1 wherein, at the at least one intermediate protocol layer, said controller encodes data prior to transmission; and wherein said controller also changes the encoding based upon a determination that the QoS metric has fallen below the QoS threshold.

8. Cancelled.

9. (Currently Amended) The MANET of Claim [[4]] 1 wherein, at the lower protocol layer, said controller cooperates with said wireless communications device to transmit data at a data rate; and wherein said controller also cooperates with said wireless communications device to change the data rate based upon a determination that the QoS metric has fallen below the QoS threshold.

10. (Original) The MANET of Claim 1 wherein the upper protocol layer comprises an application layer.

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11. (Original) The MANET of Claim 1 wherein the at least one intermediate protocol layer comprises at least one of a session layer, a transport layer, a network layer, and a radio transport layer.

12. (Original) The MANET of Claim 1 wherein the lower protocol layer comprises a physical layer.

13. (Original) The MANET of Claim 1 wherein the QoS threshold is based upon at least one of available bandwidth, error rate, end-to-end delay, end-to-end delay variation, hop count, expected path durability, and priority.

14. (Currently Amended) A mobile ad hoc network (MANET) comprising:

a plurality of mobile nodes each comprising a wireless communications device providing a selectable signal transmission pattern and a controller connected thereto;

said controller operating in accordance with a multi-layer protocol hierarchy for,

at an upper protocol layer, establishing a quality-of-service (QoS) threshold[[;]],

at at least one intermediate protocol layer below the upper protocol layer,

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selecting at least one route to
at least one destination mobile node based
upon the QoS threshold,

determining whether a QoS metric
for the selected route falls below the QoS
threshold, and

selecting between a unicast
communications mode and a multicast
communications mode based upon the QoS
threshold[[;]], and

at a lower protocol layer below the at least
one intermediate protocol layer, cooperating with said
wireless communications device to

determine the QoS metric for the
at least one selected route,

transmit data to the at least
one destination mobile node via the at
least one selected route based upon the
selected communications mode, and

change at least one signal
characteristic based upon a determination
that the QoS metric has fallen below the
QoS threshold, and

modulate the data using a first
modulation technique if the QoS metric is
greater than or equal to the QoS
threshold, and otherwise use a second
modulation technique.

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15. (Original) The MANET of Claim 14 wherein, at the at least one intermediate protocol layer, said controller determines whether to require data reception acknowledgements based upon the QoS threshold.

16. (Original) The MANET of Claim 14 wherein the at least one signal characteristic comprises at least one of power, gain, and signal pattern.

17. (Original) The MANET of Claim 14 wherein, at the at least one intermediate protocol layer, said controller encodes data prior to transmission; and wherein said controller also changes the encoding based upon a determination that the QoS metric has fallen below the QoS threshold.

18. Cancelled.

19. (Original) The MANET of Claim 14 wherein, at the lower protocol layer, said controller cooperates with said wireless communications device to transmit data at a data rate; and wherein said controller also cooperates with said wireless communications device to change the data rate based upon a determination that the QoS metric has fallen below the QoS threshold.

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20. (Original) The MANET of Claim 14 wherein the upper protocol layer comprises an application layer.

21. (Original) The MANET of Claim 14 wherein the at least one intermediate protocol layer comprises at least one of a session layer, a transport layer, a network layer, and a radio transport layer.

22. (Original) The MANET of Claim 14 wherein the lower protocol layer comprises a physical layer.

23. (Original) The MANET of Claim 14 wherein the QoS threshold is based upon at least one of available bandwidth, error rate, end-to-end delay, end-to-end delay variation, hop count, expected path durability, and priority.

24. (Currently Amended) A method for operating a mobile node in a mobile ad hoc network (MANET), comprising a plurality of mobile nodes, in accordance with a multi-layer protocol hierarchy, the mobile node comprising a wireless communications device providing a selectable signal transmission pattern, and the method comprising:

at an upper protocol layer, establishing a quality-of-service (QoS) threshold;

at at least one intermediate protocol layer below the upper protocol layer, selecting between a

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unicast communications mode and a multicast communications mode based upon the QoS threshold; and
at a lower protocol layer below the at least one intermediate protocol layer, causing the wireless communications device to transmit data to at least one destination mobile node based upon the selected communications mode, and determining a QoS metric for the at least one selected route;

at the at least one intermediate protocol layer, determining whether the QoS metric falls below the QoS threshold; and

at the lower protocol layer, modulating the data using a first modulation technique if the QoS metric is greater than or equal to the QoS threshold, and otherwise using a second modulation technique.

25. (Original) The method of Claim 24 further comprising:

at the at least one intermediate protocol layer, selecting at least one route to the at least one destination mobile node based upon the QoS threshold; and

at the lower protocol layer, causing wireless communications device to transmit the data to the at least one destination mobile node via the at least one selected route.

26. (Original) The method of Claim 24 further comprising, at the at least one intermediate protocol

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layer, determining whether to require data reception acknowledgements based upon the QoS threshold.

27. Cancelled.

28. (Currently Amended) The method of Claim [[27]] 24 further comprising, at the lower protocol layer, causing the wireless communications device to adjust at least one signal characteristic based upon a determination that the QoS metric has fallen below the QoS threshold.

29. (Original) The method of Claim 28 wherein the at least one signal characteristic comprises at least one of power, gain, and signal pattern.

30. (Currently Amended) The method of Claim [[27]] 24 further comprising, at the at least one intermediate protocol layer:

encoding data prior to transmission; and
changing the encoding based upon a
determination that the QoS metric has fallen below the
QoS threshold.

31. Cancelled.

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32. (Currently Amended) The method of Claim ~~[[27]]~~ 24 further comprising, at the lower protocol layer:

causing the wireless communications device to transmit data at a data rate; and

causing the wireless communications device to change the data rate based upon a determination that the QoS metric has fallen below the QoS threshold.